Paper No. 26

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte HIROSHI NOGAMI

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Appeal No. 1999-2117
Application No. 08/795,197

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ON BRIEF

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Before GARRIS, WARREN, and TIMM, Administrative Patent Judges.

GARRIS, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on an appeal from the final rejection of claims 1-15 which are all of the claims in the application.

The subject matter on appeal relates to a plasma processing method using helicon wave excited plasma comprising controlling dissociation of a processing gas by setting an applied source power lower than a source

power corresponding to a discontinuous change of certain parameters. Specifically, the aforementioned discontinuous change relates to (1) a characteristic line of electron density or saturated ion density as a function of a power source or (2) a gradient of a straight line approximately linearized to a characteristic line of electron density or saturated ion current density as a function of a source power. This appealed subject matter is adequately illustrated by independent claims 1 and 4 which read as follows:

> 1. A plasma processing method using helicon wave excited plasma comprising the steps of:
>
> controlling dissociation of a processing gas by setting an applied source power lower than a source power corresponding to a discontinuous change on a characteristic line of electron density or saturated ion current density as a function of a power source.
>
> 4. A plasma processing method using a helicon wave excited plasma comprising the steps of:
>
> controlling dissociation of a processing gas by setting an applied source power lower than a source power corresponding to a discontinuous change in a gradient of a straight line approximately linearized to a characteristic line of electron density or saturated ion current density as a function of a source power.

The references relied upon by the examiner as evidence

of obviousness are:

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|---|---|---|
| Campbell et al. (Campbell) | 5,421,891 | Jun. 6, 1995 |
| Sakai et al. (Sakai) | 5,503,901 | Apr. 2, 1996 |

Amorim et al. (Amorim), "High-density plasma mode of an inductively coupled radio frequency discharge," 9 J. Vac. Sci. Technol. B, No. 2, pp. 362-65 (Am. Vacuum Society, Mar./Apr. 1991).

Nakano et al. (Nakano), 61 Helicon wave excited plasmas, No. 7, pp. 711-17 (1992).

Sugai, "Recent Development of Plasma Sources for Thin Films Processing," Proceedings of The 12th Symposium on Ion Beam Technology Hosei University, pp. 15-20 (December 10-11, 1993).

All of the appealed claims stand rejected under 35 U.S.C. § 103 as being unpatentable over various combinations of the above-listed references.

We refer to the brief and to the answer for a complete exposition of the opposing viewpoints expressed by the appellant and by the examiner concerning the above-noted rejections.

## OPINION

We cannot sustain the rejections advanced by the examiner on this appeal.

We agree with the appellant's fundamental position that the applied references contain no teaching or suggestion which would have motivated one having ordinary skill in the art to combine these references in such a manner as to result in a plasma processing method of the type here-claimed wherein dissociation of a processing gas is controlled by setting an applied source power lower than a source power corresponding to the discontinuous change defined by the independent claims on appeal. Indeed, as correctly indicated by the appellant in his brief, many of the references applied by the examiner are not even concerned with the here-claimed goal of controlling dissociation of a processing gas.

Moreover, none of the applied references contain any teaching or suggestion for effecting this control by setting an applied source power lower than a source power corresponding to a discontinuous change of the type claimed by the appellant. For example, while the Sakai Patent relates to controlling dissociation in order to enhance selectivity, this is effected by increasing flow rate (e.g., see Figure 11 and the paragraph bridging

columns 14 and 15) rather than by setting an applied source power lower than a source power corresponding to the discontinuous change defined by the appealed independent claims.

At most, the applied references reflect that the prior art recognized the existence of the here-claimed parameters involving a discontinuous change relating to a characteristic line of electron density or saturated ion current density as a function of a power source. However, we perceive nothing and the examiner points to nothing in these references which evinces a recognition in the prior art that such a parameter would be effective in achieving the appellant's claimed goal of controlling dissociation of a processing gas in a plasma processing method using helicon wave excited plasma. Compare In re Antonie, 559 F.2d 618, 620, 195 USPQ 6, 8-9 (CCPA 1977).

For at least the reasons set forth above, we cannot sustain the rejections before us on this appeal.

The decision of the examiner is reversed.

REVERSED

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| BRADLEY R. GARRIS<br>Administrative Patent Judge | ) | |
| CHARLES F. WARREN<br>Administrative Patent Judge | ) | BOARD OF PATENT APPEALS AND INTERFERENCES |
| CATHERINE TIMM<br>Administrative Patent Judge | ) | |

BRG:hh

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